

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization  
International Bureau



PCT



(43) International Publication Date  
7 December 2006 (07.12.2006)

(10) International Publication Number  
**WO 2006/129109 A2**

(51) International Patent Classification:  
**H01J 49/42** (2006.01)

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(21) International Application Number:  
PCT/GB2006/002028

(81) Designated States (*unless otherwise indicated, for every kind of national protection available*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, LY, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SM, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(22) International Filing Date: 5 June 2006 (05.06.2006)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:  
0511375.8 3 June 2005 (03.06.2005) GB

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(84) Designated States (*unless otherwise indicated, for every kind of regional protection available*): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

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**Published:**

— *without international search report and to be republished upon receipt of that report*

*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

(54) Title: IMPROVEMENTS IN AN ELECTROSTATIC TRAP

(57) Abstract: An electrostatic trap such as an orbitrap is disclosed, with an electrode structure. An electrostatic trapping field of the form  $U(r, \phi, z)$  is generated to trap ions within the trap so that they undergo isochronous oscillations. The trapping field  $U(r, \phi, z)$  is the result of a perturbation  $W$  to an ideal field  $U(r, \phi, z)$  which, for example, is hyperlogarithmic in the case of an orbitrap. The perturbation  $W$  may be introduced in various ways, such as by distorting the geometry of the trap so that it no longer follows an equipotential of the ideal field  $U(r, \phi, z)$ , or by adding a distortion field (either electric or magnetic). The magnitude of the perturbation is such that at least some of the trapped ions have an absolute phase spread of more than zero but less than about  $2\pi$  radians over an ion detection period  $T_m$ .

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